VAN LENNEP (W. B.)

Compliments of the Author.

CASES OF CRANIAL FRACTURE,

WITH

REMARKS AND PRESENTATION OF CASES.

BY

WM. B. VAN LENNEP, A.M., M.D.,

PHILADELPHIA.

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WILLIAM B. VAN LENNEP, A.M., M.D.,
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In looking over my notes for surgical work during 1891 and 1892 I find, among thirty-six operations on the cranium for lesions of its contents, fourteen for recent traumatisms and at least nine for the remote effects of injuries. In view of the great mortality in cases treated under the expectant plan, and of the resulting conditions in those that survive, such as epilepsy, imbecility and insanity, which are often worse than death, prompt recognition and as prompt radical treatment, when indicated, cannot be too strongly insisted upon. The operative surgery of the brain has swung from one extreme to the other in the past, and, thanks to the immunity given by antiseptic technique, we are now near the operative extreme. The many unsuccessful operations for the remote effects of injuries have done much of late to bring brain surgery into disrepute, and justly so, but the blame should not be laid at the door of the operation, for it really belongs to the treatment of the primary injury. Besides the "epileptic habit," for instance, there are definite sclerotic changes, which spread from the seat of the injury and involve large areas of brain tissue that cannot be affected by cutting out cicatrices, emptying cysts, etc. (Sachs). From lessons learned in the treatment of these cases I feel that while we may be more skeptical or conservative in the surgical treatment of the remote effects of injuries we should be more prompt and more heroic in relieving pressure and removing irritants, in short, in preventing inflammation in recent traumatisms.

To my mind there can be no better place to discuss this important

question than in a Society like this, where the general practitioner, the neurologist, the ophthalmologist, the otologist, and the general surgeon meet together.

I have selected the following cases because they are recent, and it is to the treatment and recognition of these that I am anxious to direct particular attention, as every hour of delay increases the danger to life and of subsequent brain impairment. They are also selected not so much for the results obtained, but as illustrating the different types of injury that we most frequently meet with.

I. *Open, comminuted, depressed fracture of the parietal and temporal (squamous portion), with laceration of the dura.*

W. B., 50 years old, laborer, operated June 30, 1891, was struck on the head by a block and tackle weighing about 150 pounds, which had fallen some fifteen feet. This had caused a large, ragged scalp wound, through which extensive comminution and depression of the squamous plate and the parietal could be made out, in the posterior and superior portions of the right temporal fossa. The wound was thoroughly cleansed, the scalp shaved and an antiseptic dressing applied by the house surgeon of the Hahnemann Hospital. There were no symptoms. When I saw him I at once enlarged the wound, trephined, elevated the depressed bone, removed several pieces which had perforated the dura, disinfected and closed the wounds in the latter, drained with iodoform gauze and sutured the scalp with silk worm gut.

There was nothing to note during the week he was in the hospital, and he is presented to the society for examination. It is now nearly fifteen months since the injury, and he enjoys good health and is in full possession of his mental faculties.

The indications in this case were clear and an operation imperatively called for, even in the absence of symptoms. Death would have probably resulted, but, if by disinfection and occlusion fatal brain inflammation had been prevented, the pressure and irritation must undoubtedly have produced changes that would have shown their effects afterwards.

In marked contrast with this case and showing the results of *no* treatment is the following:

II. *Open, depressed, fracture of the temporal bone (squamous portion) with laceration of the dura; encephalitis.*

Male, of middle age, after exposure to the sun, was, it is said, attacked with vertigo and fell against a hitching post, sustaining a contused wound two inches above and a little posterior to the biauricular line on the left side. He lost consciousness and remained

in a stunned condition for thirty-six hours, when a physician was called in and the diagnosis of concussion made. Twenty-four hours later convulsions set in, which were thought to be apoplectic, fracture being excluded on account of the apparently slight injury. On the fourth day Dr. Bartlett saw him and insisted on an immediate, forlorn-hope trephining. The temperature, which was above 106°, was reduced to 103° before the operation by the use of the ice pack. There was the deepest possible coma, dilatation of the pupils, insensitive corneæ, complete paralysis of the extremities and sphincters.

The external wound was enlarged, and an inch below and anterior to it was found a depressed fracture of the squamous plate. The depressed portion was one inch long by one-half inch wide and perforated the dura. The trephine opening was very freely extended downwards and backwards, the lateral sinus being separated from the cranium and exposed, and the dura opened to a corresponding extent. A fulminating, septic meningitis was present with seropurulent effusion, sticky membranes and enormous dilatation of the vessels of the pia.

The relief of the pressure was shown by returning sensitiveness of the cornea and some movements of the right side, but the patient died, and that, too, in a very few hours.

Had this man been seen at once, and the wound cleaned and dressed properly, his life might been saved; had he then been trephined and the depressed bone removed, there is but little doubt that he would have made a perfect recovery.

I desire right here to take exception to the term "concussion." There is the general impression, and I confess that I shared it, for which text-books and surgical teachers are to blame, or perhaps better, for which the tenacity with which we cling to antique nomenclature is responsible, that *concussion* is functional, *compression* is organic; or, in other words, the former means recovery, the latter death. Concussion, however, is produced by laceration, and, if recovery takes place with or without the intensified clinical picture known as compression, there are apt to follow reminders of the injury to the great nerve centres. They are both parts of cerebral traumatism and as such deserve the most suspicious observation.

The case was indeed a deceptive one at the beginning, and therefore instructive. A small, contused wound, which neither the patient nor his friends noticed; a small depressed splinter, an inch from the wound, which could not have been made out from the wound, or through the scalp; and a history of probable sunstroke!

I recall two recent cases treated by careful and competent observers, which illustrate the difficulties in arriving at a diagnosis, and

the importance of suspecting and investigating for fracture in every doubtful case.

1. A man was picked up on the street, drunk, and quickly developed what was considered delirium tremens. The head was carefully examined and nothing but a slight bruise found over the left eyebrow. The autopsy showed a fissure of the orbital and the vertical plates of the frontal, and a diffuse meningitis.

2. A man was picked up on the street and apoplexy diagnosed; when the scalp was shaved we found a contusion and a small wound above and behind the ear. He was vomiting profusely and died while we were preparing to operate. Fracture was the cause of death.

The tolerance of the brain to such injuries, when infection does not take place, is well illustrated by the next case.

III. *Open, comminuted, depressed fracture of the temporal bone (squamous portion) with laceration of the dura, and penetration of the brain.*

M. S., 32 years old, operated August 23, 1892, was struck, five weeks before, by a large iron pulley in the right temporal region. Through the external wound three depressed bits of bone were removed. The patient remained in a semi-comatose condition, with exacerbations and ameliorations, and a varying temperature, until seen by Dr. Thomas Reading, who at once summoned me. The next day the granulating wound was enlarged, after the usual antiseptic preparations; there was a *fungus cerebri* projecting through an opening in the dura, just above and behind the ear; the entire squamous portion of the temporal bone and the lower border of the parietal were splintered and depressed, being driven upward under the edge of the latter bone. Eleven fragments were removed, at least three of which penetrated the dura and punctured the brain.

Recovery was slow as regards the mental condition, though uneventful. Abscess was suspected, but apparently it is no longer to be feared. The wound, which was packed and left open, is healing nicely by granulation.

While this patient has practically recovered and is presented for examination, I fear that the inflammatory changes that have taken place must produce permanent brain impairment.

IV. *Closed, comminuted, depressed fracture of the temporal, sphenoid, and parietal bones; extra-dural hæmorrhage.*

J. K., age 38, operated April 2, 1891, fell through an elevator shaft and was brought to the Hahnemann Hospital with a contusion of the right temporal fossa causing enormous swelling, ecchymosis

of the right orbit, and profuse, persistent bleeding from the right nostril. The scalp was at once shaved, scrubbed, and covered with a wet bichloride cloth, the nose disinfected and packed with gauze, and an ice-bag applied to the eye. He had practically no symptoms, except that he seemed dazed and was considerably shocked, but in a few hours stupor and paralysis of the left side developed and intensified. No fracture could be made out on account of the enormous swelling, but, on incising the scalp, the whole temporal fossa was found depressed and comminuted, and portions of the squamous plate, parietal, and sphenoid were removed, from the external angular process to the occipital bone.

Under the bone was found an enormous clot which was carefully washed and picked away (not entirely however). The dura was intact, and, as there was no further hæmorrhage, the cavity was drained with iodoform gauze and the external wound closed with silk-worm gut.

Some cerebral excitement followed, but only lasted twenty-four hours, and he was discharged in two weeks cured. He is here for examination.

The difficulty of making out a fracture through a bruised and boggy scalp is here exemplified, for, although the whole temporal fossa was crushed in, we could not say positively that there was depression until the scalp was laid open. The depression too, though extensive, produced no symptoms beyond those of so-called "concussion," until the characteristic picture of meningeal hæmorrhage developed.

I am inclined to doubt the advisability of leaving a portion of the clot, instead of removing it all and tying the bleeding points. The clot however extended so far down that it would have been hard to catch a bleeding vessel, pressure was abundantly relieved, the dura was intact, free drainage was provided, and I felt pretty sure of my asepsis. The result was all that could be desired.

V. *Laceration of the brain and probable fracture of the base; subdural hæmorrhage.*

Mrs. A. D., an elderly lady, patient of Dr. Pampinelli, fell down a long flight of stairs, striking the left side of the head on a stone pavement. When seen, immediately after the accident, by the Doctor, she was conscious and presented the usual symptoms of so-called "concussion." About two hours later there gradually developed stupor, followed by deep coma and stertor, and complete paralysis of the right side. I saw her some ten hours after the accident and operated at once. A large semicircular flap of the scalp was raised, exposing the whole temporal fossa, the region of the bruise. A one-

inch trephine was applied over and in front of the ear, on a level with the external angular process, and the inner surface of the skull explored with a negative result. The dura bulged prominently and looked dark, and, guided by this, the bony opening was freely enlarged downward and backward, the membrane incised, and a large clot washed out, which extended to the base in the middle fossa. There being no further bleeding, the dura was partially closed with catgut, leaving room for an iodoform gauze drain, and the outer wound similarly treated with a buried suture.

Movements on the right side showed themselves at once, but the patient remained comatose, and sank and died the next day.

I felt the responsibility of opening an intact skull, in this instance, very keenly, especially as a member of the family, who objected to the operation, stood by ready to wreak vengeance on the surgeon if he did not demonstrate a lesion. The skull was opened at the point named with a view of going forward to arrest a hæmorrhage from the middle meningeal, or backward and upward to relieve pressure in the region of the Rolandic fissure.

VI. *Closed, fissured fracture of the temporal (squamous portion), with depressed splinter of the inner plate; serous apoplexy.*

G. C., 24 years old, operated April 5, 1892. Fell twenty feet from a crane, striking his right shoulder and the right side of his head. When brought to the Hahnemann Hospital he was much shocked, requiring stimulation with ammonia; unconscious, could not be aroused, but winced when the bruise in the right temporal region was pressed on; the reflexes on the right side were exaggerated, those on the left diminished; the pupils reacted to light, and he vomited several times. The temporal fossa was laid bare, exposing a small fissure which ran from below upward into the squamo-parietal suture. On removing a one-inch button, a splinter from the under surface was withdrawn from the dura into which it had been driven. This membrane bulged into the wound and was incised; a quantity of fluid was evacuated, the flow keeping up several days, and requiring frequent change of the dressings. There was nothing else abnormal.

Improvement came gradually, consciousness returning on the second day; restlessness and impaired power on the left side continuing several days longer, and irritative symptoms reappearing on several occasions. The wound healed kindly, and he was discharged at the end of six weeks. He is here for examination.

While the recovery here has been quite satisfactory, and the operation saved life, the extensive shaking up and laceration of the brain will be felt for a long time. Although mentally sluggish before the

injury, I do not think he is back to the normal in this respect, but he is steadily improving.

The importance of an outlet for the relief of pressure is well shown by this case, as well as the necessity of going through a fissure to make sure there is not a splintering of the inner plate.

I well remember a case, seen some years ago, of a man who had fallen some distance, striking the top of his head. There was an extensive bruise on both sides, but no external fracture; deep coma and complete paralysis, one foot showing the faintest sensation. The inner plate was splintered on this side producing an enormous hæmorrhage. In such cases, the slightest localizing symptom may be of the greatest value.

VII. *Closed, fissured fracture of the frontal (vertical and orbital portions, external plate); open, comminuted fracture of the inner plate (frontal sinus); and of the ethmoid (horizontal plate); laceration of the dura and brain.*

G. S., 21 years old, fell twenty-five feet through an elevator shaft, striking the left supraorbital region on the edge of a block of stone. As luck would have it, the right eye was a glass one. He was admitted to the Hahnemann Hospital, February, 20, 1892. There was a contusion over the left eyebrow, but no fracture could be made out; persistent and profuse bleeding from the nose; extensive œdema and ecchymosis of the upper lid; chemosis, complete loss of vision even to bright light, with good motion of the eyeball, clear media, and a fixed, dilated pupil. There was no paralysis, the tendon reflexes being exaggerated on both sides, and the mental condition one of semi-stupidity, which increased. Besides, the left radius was broken, the right wrist and middle finger dislocated, and the iliac crest badly bruised.

A flap was raised, following, for cosmetic reasons, the line of the eyebrow, and curving upward in the temporal fossa; a linear fracture was found, running upward from the middle of the supraorbital arch for two inches, and backward along the roof of the orbit toward the optic foramen. There was no displacement. A three-quarter-inch trephine was applied at the upper end of the fissure, the removal of the button exposing an extensive comminution of the inner wall of the frontal sinus and the horizontal plate of the ethmoid. The dura was torn, as well as the anterior lobe of the brain. After removing all loose bits of bone, and disinfecting the nose, a drainage-tube was passed through the cribriform plate and out of the left nostril (Allis). The nose was tightly packed, the external wound sutured with silk-worm gut and drained with a strip of iodoform gauze which was brought out behind the external angular process. The wound healing was all that could be desired, his condition improving at once, and he recovered his eyesight, completely

and suddenly, on the eleventh day. Subsequent observation has shown progressive atrophy of the optic nerve with diminished vision, but, of late, while the nerve-changes are present, his sight has improved to a wonderful degree ($\frac{15}{100}$ to $\frac{15}{30}$). Otherwise his health is good, and he is presented for examination.

Fractures of the optic foramen are sufficiently rare to be recorded, there being only about eighty reported in medical literature, and the sudden recovery of vision, as well as its recent improvement are unusual.

The very extensive comminution of the internal plate was out of all proportion as compared with the fissure in the external plate, fractures in this region deserving particular attention on this account and because, though closed externally, they are open internally through their communication with the nose and the frontal sinus.

In a case presenting a similar but less marked mental condition, with exaggerated reflexes, the diagnosis was made from the fact that, while there was a contusion and a small wound of the forehead, progressive ecchymosis of the upper lid appeared. Trephining showed an almost identical fracture with more extensive brain laceration.

VIII. *Open, comminuted fracture of the frontal bone; fissured fracture of the ethmoid (cribriform plate).*

J. M., 21 years of age, fell down a flight of cellar steps, striking his head against a stone floor. Was considerably dazed, but walked to the Hahnemann Hospital Dispensary where he was examined with the following result:

Patient is dull and drowsy; will answer questions, but lapses at once into his former apathetic condition; no paralyses or exalted reflexes. Over the right eyebrow is a ragged, contused wound about an inch and a half long, which leads down to comminuted bone; there is free and persistent epistaxis.

He was at once admitted to the Hospital, etherized, the field of operation shaved and cleansed, and the wound freely enlarged. After picking away the comminuted anterior wall of the frontal sinus, it was found that the posterior wall was more extensively fractured, and that the anterior lobe of the brain was exposed, the dura, however, being, fortunately, intact. A three-quarter inch trephine was applied, just above the sinus, and the sharp edges of the fracture bitten off with Rongeur forceps. The horizontal plate of the ethmoid was also found to be fissured. After a scrupulous cleansing, iodoform gauze was lightly packed in as a drain, and the wound closed with a sub-cuticular, continuous suture of catgut. The nose too was disinfected.

Recovery was rapid and uneventful, and he was discharged at the

end of ten days. This patient has gone to Ireland, but is reported perfectly well.

In this case disinfection and occlusion would not have prevented infection, which would have taken place through the nose and sinus. It shows the importance of enlarging an opening in the outer plate to ascertain the condition of the inner.

I would submit the following propositions and trust that some of them may merit discussion :

1. All contusions of the head should be examined most thoroughly and observed subsequently, no matter how slight the blow. This is particularly important when the injury is in the temporal region or forehead, the bone being thin in the former, and fractures being open internally in the latter location.

2. All scalp wounds should be viewed with suspicion. The head should be thoroughly scrubbed for some distance in every direction, and shaved if necessary, the wound scrupulously disinfected, and, unless very superficial, enlarged and deepened so as to allow an *inspection* of the skull. With the wound treatment of to-day there is no increase of danger from such a step, which saves many a life.

3. Loss of consciousness should always be looked upon as due to a possible head injury, if there is the barest chance of such having taken place, even in the presence of alcoholism, uræmia, opium poisoning, or apoplexy.

4. In the presence of brain symptoms, that is, exaltation or depression of mental, sensory, or motor functions, which are not steadily improving, where an injury has been inflicted, the skull should be explored. The guide to such an exploration may be the signs of an injury, a wound or a bruise, or, what is still more reliable, localizing symptoms. So too should the skull and then the dura, if necessary, be opened and their contents explored. The dangers are *nil* in laying bare the bone, slightly increased by trephining, only sufficient to cause hesitation when the dura is opened, and still greater when the brain is incised.

5. Trephining is done to remove pressure and irritants, to prevent sepsis, and, what is not sufficiently emphasized, to relieve tension. The sooner it is done the better, the mortality of primary or early operations being as one to thirty when compared with secondary or late ones (Wagner).

6. In a general way all fractures *that can be made out* should be trephined, whether brain symptoms are present or not.

But to explain:

All punctured fractures must be trephined.

All depressed fractures should be trephined; if open, of course; if closed, on account of the almost inevitable subsequent evils.

All fissured fractures should be trephined; if closed and causing no symptoms, they cannot be made out. Once visible they require most thorough disinfection, and trephining or chiselling of, at least, the outer plate. They belong to the most dangerous and treacherous class of lesions.

7. In fractures of the base the whole head should be most carefully examined for lesions. Orifices through which infection may enter, such as the nose and ear, should be scrupulously cleaned and occluded, but such occlusion should not dam back discharges. If accessible lesions or localizing symptoms are made out, trephining is, of course, called for.

A word regarding the operative technique:

It is usually safer and as cosmetic to shave the whole scalp before operations on the skull.

Mechanical disinfection is accomplished by vigorous scrubbing with a stiff brush and potash soap, supplemented by ether, to get away the masses of epithelium glued together by sebum and sweat. Then alone can chemical purification be of value, and it is accomplished by scrubbing and prolonged contact with sublimate (1 to 2000).

Flaps should be formed with a view to affording subsequent drainage and to avoid deforming scars. They include all the tissues down to the bone.

Hæmorrhage is arrested by clipping the entire thickness of the scalp, tying or throwing a suture around any freely bleeding points at the close of the operation. The Esmarch band is unnecessary.

The most easily handled trephine is one of three-quarters or one inch diameter. Roberts's instrument is the one most easily kept clean. The opening can be quickly enlarged with the Rongeur or gnawing forceps.

The inner surface of the skull can be explored for quite a distance with the dural separator, and the sinuses detached from the bone with the same instrument.

The dura is, of course, opened at a little distance from the edge of the bony aperture to facilitate subsequent suture with catgut.

Its interior is examined by the finger which presses the brain out

of the way, while the substance of the latter is entered with a grooved director or knife. Clean cut wounds of the brain heal kindly and are not followed by epilepsy, whereas tears or bruises notoriously produce the opposite results.

Hæmorrhage from the meningeal vessels can be reached by biting away the bone, and arrested by a stitch of catgut; that from a sinus, with hæmostats, which are left in place by ligature, suture, or, in certain localities, by packing. Bleeding from the exceedingly friable vessels of the pia is best treated by pressure, heat, or, rarely, by a very carefully applied ligature.

For drainage I have employed iodoform gauze; it should be remembered that it has two uses, to make pressure when packed tightly, and as a capillary drain when put in loosely.

To close the scalp wound I prefer silkworm-gut or catgut. The former is not apt to be followed by stitch abscesses from infection by the hair follicles, and these can be avoided by using the latter as a buried suture. I cannot speak too highly of the results obtained wherever I have used this subcutaneous method.

Dressings scarcely need mention. Aristol, or iodoform (1), boric acid (3), and sublimate (1 to 500) are dusted over the wound, cavities being packed with iodoform gauze. Occlusion and absorption are obtained by an abundance of gauze, absolutely sterile, or *fresh* from an antiseptic solution. This is changed or more added as soon as discharges come through, and before decomposition sets in.